JPRS 75949

27 June 1980

USSR Report

PHYSICS AND MATHEMATICS

No. 64

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available through Bell & Howell, Old Mansfield Road, Wooster, Ohio, 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

Soviet books and journal articles displaying a copyright notice are reproduced and sold by NTIS with permission of the copyright agency of the Soviet Union. Permission for further reproduction must be obtained from copyright owner.

JPRS 75949

27 June 1980

USSR REPORT

PHYSICS AND MATHEMATICS

No. 64

CONTENTS

CRYSTALS AND SEMICONDUCTORS

Giant Crystals 1

Plasma Echo in Bismuth 2

Critical Behavior of a Liquid Crystal Near the Phase Transition Between Two Ferroelectric Phases 2

Kinetics of Parametric Instability of Elastic Waves in a Dielectric 3

FLUID DYNAMICS

Self-Focusing and Quasi-Waveguide Propagation of a Gaussian Beam in a Supersonic Gas Flow 4

New Effects Observed When Two-Phase Media Flow in an Electric Field 4

Asymptotic Solution Near Shock-Layer Separation Point in Hypersonic Flow Around Blunt Bodies 5

On Solution of One System of Quasilinear Equations in Gas Dynamics 6

LASERS AND MASERS

Lasers with Optical Pumping Based on Four-Atom Molecules of the C_{3v} Symmetry Group 7

Pecularities in the Dynamics of Free Lasing of a $KGd(WO_4)_2:Nd^{3+}$ Laser 7

Influence of Phase Effects on the Process of Formation of Narrow-Band Radiation in a Laser with an Electrooptical Q-Switch 8

Conditions of Generation of a Compound Cavity with Lenses 8

NUCLEAR PHYSICS

Achievements of Physicists 9

Game-Theory Approach to Solution of Recognition or Classification Problems 11

Difference and Relation Between Channeled Particles and Coherent Bremsstrahlung 11

Synthesis of Titanium Nitride in a Nitorgen Atmosphere at High Pressures under Laser Exposure 12

Generation of Neutrons in Explosive Initiation of the DD-Reaction in Conical Targets 13

STRESS, STRAIN AND DEFORMATION

On Dynamic Instability of a Cylindrical Shell with an Attached Mass 14

Impact Compression of Porous Bodies 14

SUPERCONDUCTIVITY

Resistive Domain in Type II Superconductors 16

GIANT CRYSTALS

Moscow IZVESTIYA in Russian 18 Mar 80 p 3

[Article by V. Ryzhov, Khar'kov]

[Text] Scientists at the All-Union Scientific Research Institute of Monocrystals, Scintillating Materials and Ultrapure Chemicals have succeeded in producing a gigantic, transparent crystal that weighs 143 kg. The complex formation process, which takes thousands of years in the bowels of the earth, lasts a total of 6 days under laboratory conditions. Crystal growth takes place in an automated electric furnace that was designed by specialists. The nucleus of the future giant crystal is a small fragment of calcium chloride that resembles common table salt. New "levels" of the crystal lattice grow on it. Special devices are used to maintain the thermal conditions and the rate and other special growth conditions.

The large crystals that are being grown in Khar'kov have an almost ideally regular structure. They are needed in acoustics and medical technology and for the production of large-diameter optical lenses.
[139-11746]

11746
CSO: 1862

PLASMA ECHO IN BISMUTH

Moscow PIS'MA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 31, No 1, 5 Jan 80 pp 3-6 manuscript received 5 Sep 79

LEVIYEV, G. [illegible], and POTAPENKO, S. YU., Institute of Solid-State Physics, USSR Academy of Sciences

[Abstract] A third-order transverse plasma echo can be observed in a metal having a spherical Fermi surface if there is a group of electrons which forms a mirror reflection of the metal surface. With an arbitrary Fermi surface, the transverse echo may also occur in the second order over the wave field when the spectrum is anisotropic. An expression is derived for the echo coordinate in the case of an ellipsoidal Fermi surface in the presence of a magnetic field. In an actual metal, the role of planes around which the electromagnetic fields are localized is played by the surfaces of the plate. When both fields are localized on one surface, the situation is analogous to a limitless metal in which the distance between the field sources if L = 2d (d is specimen thickness). A plate of bismuth 0.2 mm thick was placed between two resonators tuned to the frequencies 9200 and 18,400 MHz. Temperature of the specimen was 4.2 K. The dependence of the echo signal on the magnetic field is very similar to the dependence of echo amplitude in the plasma on the coordinate of the probe. Figures 1; references 7: 5 Russian, 2 Western.
[89-8617]

CRITICAL BEHAVIOR OF A LIQUID CRYSTAL NEAR THE PHASE TRANSITION BETWEEN TWO FERROELECTRIC PHASES

Moscow PIS'MA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 31, No 1, 5 Jan 80 pp 37-41 manuscript received 10 Nov 79

BERESNEV, L. A., BLINOV, L. M. and PURVANETSKAS, G. V., Scientific-Research Institute of Organic Polyproducts and Dyes (NIOPiK)

[Abstract] Critical retardation of Debye relaxation of spontaneous polarization in the neighborhood of the H smectic to C smectic structural phase shift in a liquid crystal has been recorded. The H smectic phase (SmH) appears in some liquid crystals upon cooling of the smectic C (SmC) phase. In contrast to SmC, where the molecules have only a specific direction of orientation of the long axes at a certain angle to the normal of the layer, in SmH there is hexagonal packing of molecules in each layer. Because of specific viscous-elastic properties in the SmH phase, it is impossible to determine spontaneous polarization by methods of repolarization in a variable field or using a mechanical shift. The object of investigation was the ferroelectric liquid crystal L-p-hexyloxybenzylidene-p'-amino-2-chloropropylcinnamate, which has readily identifiable ferroelectric SmH and SmC phases. References 8: 3 Russian, 5 Western.
[89-8617]

KINETICS OF PARAMETRIC INSTABILITY OF ELASTIC WAVES IN A DIELECTRIC

Moscow PIS'MA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 31, No 1, 5 Jan 80 pp 45-49 manuscript received 2 Feb 79; after revision 11 Nov 79

IL'CHENKO, L. N. and OBOZNENKO, YU. L., Kiev State University imeni T. G. Shevchenko

[Abstract] Parametric excitation of transverse elastic waves with a frequency of 3/7 and 4/7 of the frequency of a longitudinal elastic excitation wave in a single crystal of paratellurite was described earlier. There is also automodulation of parametrically excited waves. This parametric excitation may be represented as the interaction of two transverse phonons with oppositely directed wave vectors k_1 and k_2 and a longitudinal phonon with the wave vector k_3. Under pulsed pumping conditions there is a considerable difference between the power at onset and disappearance of stimulated emission. This power difference increases with decreasing rise time of the pumping power. No such difference exists under cw conditions, suggesting that the pumping mode is "soft." The difference in behavior of magnons and phonons is related to the fact that in dielectrics during parametric excitation of phonons there is no negative non-linear damping. References 4: Russian.
[89-8617]

UDC 533.6+535.211

SELF-FOCUSING AND QUASI-WAVEGUIDE PROPAGATION OF A GAUSSIAN BEAM IN A SUPERSONIC GAS FLOW

Moscow DOKLADY AKADEMII NUAK SSSR in Russian Vol 251, No 2, 1980 pp 309-311 manuscript received 16 Oct 79

KUCHEROV, A. N.

[Abstract] An examination is made of thermal self-stressing of an initially collimated gaussian beam in a transverse uniform supersonic gas flow. A linearized solution of the problem predicts self-focusing of the beam in the near field. The author shows by numerical calculations that self-focusing is intensified in the far field, and demonstrates the possibility of quasi-waveguide beam propagation under certain conditions. It is shown that the effect of thermal self-stressing is characterized by the Mach number, the diffraction parameter and the absorption parameter. A finite difference scheme is used for solving the boundary value problem of beam propagation. The intensification of self-focusing results from the nearly constant pattern of density perturbations along the path of the beam. When the diffraction parameter and Mach number reach the values that are limiting for self-focusing, quasi-waveguide beam propagation is observed where the intensity distribution in the vicinity of the peak and the amplitude of the intensity peak remain nearly constant. Strictly speaking, waveguide propagation of the beam is not possible for a non-zero value of the absorption parameter. In this case the central part of the beam is kept stable by energy "pumped" from the peripheral regions. Figures 2, references 5: 3 Russian, 2 Western.
[145-6610]

UDC 531.2

NEW EFFECTS OBSERVED WHEN TWO-PHASE MEDIA FLOW IN AN ELECTRIC FIELD

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 251, No 2, 1980 pp 315-319 manuscript received 5 Nov 79

GOGOSOV, V. V., NALETOVA, V. A. and SHAPOSHNIKOV, G. A., Institute of Mechanics, Moscow State University imeni M. V. Lomonosov

[Abstract] A new many-velocity model is derived for a dispersed medium in which each of the phases is polarized in accordance with its own law. The redistribution of the volumetric concentration of the dispersed phase caused by its motion changes the permittivity of the medium, the degree of interaction between the medium and an electrical field, and the field itself, making it more nonuniform. A force proportional to the gradient of the square of the electric field acts on the dispersed phase -- bubbles

or particles. It is found that a mixture of two immiscible polarizable phases in an electric field acquires the properties of a compressible fluid. Because of the finite velocity of propagation of weak perturbations in such a medium, the behavior of the dispersed phase depends appreciably on whether flow is "subsonic" or "supersonic" relative to the velocity of propagation of weak perturbations (the "speed of sound"). A solution is found for the problem of rising or falling of a dispersed phase in a liquid in the field of a flat capacitor. It is shown that the dispersed phase may pass through the speed of sound. A detailed analysis is made of rising of a bubble system in the absence of an electric field, and it is shown that this motion is quite different from that of an isolated bubble: the uniform velocity of a bubble system is slower, and deceleration may take place until the channel is totally clogged. Figures 2, references 4 Russian.
[145-6610]

UDC 533.6.011

ASYMPTOTIC SOLUTION NEAR SHOCK-LAYER SEPARATION POINT IN HYPERSONIC FLOW AROUND BLUNT BODIES

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: 19-MATEMATIKA, MEKHANIKA, ASTRONOMIYA in Russian No 4, Oct 79 pp 61-66 manuscript received 11 Jan 79

BARANTSEV, R. G. and ENGEL'GART, V. N.

[Abstract] The classic problem of steady flow of an ideal gas around blunt bodies at an infinite Mach number is considered. In the two-dimensional formulation with plane or axial symmetry, dimensionless equations using the variables (b, τ) are written. When the adiabatic exponent κ approaches unity, the region of flow beyond the shock wave is compressed into an infinitely thin layer with infinitely great density. This layer can be separated from the body and branch out. An asymptotic solution is constructed with no a priori hypotheses on the orders of perturbation; the solution is in explicit analytical form for a wide class of contours. References 14: 10 Russian, 4 Western.
[94-8617]

UDC 621.43.011:533

ON SOLUTION OF ONE SYSTEM OF QUASILINEAR EQUATIONS IN GAS DYNAMICS

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: 19-MATEMATIKA, ASTRONOMIYA
No 4, Oct 79 pp 88-94 manuscript received 21 Jun 78

SEROVA, V. D.

[Abstract] A system of quasilinear equations describing axisymmetric flow of an ideal compressible fluid is written in matrix form. Based on physical notions, we may assume the existence and uniqueness of the solution after emergence of the gas past the tube cutoff. The time of arrival of the rarefaction wave at the axis of symmetry was calculated. The leading edge of the shock wave, gradually losing its intensity under the influence of the rarefaction wave, moves along the x-axis. In numerical calculations, the flow pattern can be re: presented quite clearly in the form of isobars, isopeaks and isotherms. References 9: 8 Russian, 1 Western.
[94-8617]

UDC 621.375.8

LASERS WITH OPTICAL PUMPING BASED ON FOUR-ATOM MOLECULES OF THE C_{3v} SYMMETRY GROUP

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 32, No 2, Feb 80
pp 233-240 manuscript received 25 Apr 79

BERTEL', I. M., IVANENKO, M. M. and CHURAKOV, V. V.

[Abstract] An attempt is made to analyze the relaxation processes characteristic for four-atom molecules of the C_{3v} symmetry group. The results of the analysis are used as a basis for study of some of the regularities of formation of population inversions and calculation of the output parameters of ammonia and phosphine-based lasers with resonant optical excitation. The temperature variation of gain and power output as well as conditions which result in lasing at new frequencies are studied. Figures 4, References 18: 3 Russian, 15 Western.
[125-6508]

UDC 621.375.8

PECULARITIES IN THE DYNAMICS OF FREE LASING OF A $KGd(WO_4)_2:Nd^{3+}$ LASER

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 32 No 2, Feb 80
pp 241-245 manuscript received 16 Apr 79

KULEV, V. S., PAVLYUK, A. A., PIVTSOV, V. S. and FOLIN, K. G.

[Abstract] A study is made of the dynamics of the free emission of a laser made of a crystal of potassium-gadolinium tungstenate, activated by neodymium ions. The results of the study reveal the pecularities in the spectral, time and space characteristics of the radiation and factors which cause them. The nature of free emission in this laser is found to be basically similar to that for all known neodymium lasers. The main pecularities are the anomalous behavior of the spectrum, indicating self-mode locking, facilitated in this case by the broad gain line and comparative homogeneity of the crystal. Figures 2, References 12 Russian.
[125-6508]

UDC 621.373.826:535.339

INFLUENCE OF PHASE EFFECTS ON THE PROCESS OF FORMATION OF NARROW-BAND RADIATION IN A LASER WITH AN ELECTROOPTICAL Q-SWITCH

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 32, No 2, Feb 80 pp 246-254

KOVALEV, A. A., TYUSHKEVICH, B. N. and SADOVSKIY, V. N.

[Abstract] An experimental and theoretical study is done on the specifics of formation of the spectral composition of monopulse radiation of a ruby laser with two cavities coupled through an electrooptical shutter. One of the cavities is used to produce narrow-band priming radiation with the shutter closed. The two cavities differ not only in their Q, but also in their natural spectra. During Q switching, the effective resonator is therefore compound, consisting of the output reflector, the reflector of the Q-switch and the supplementary cavity. The experimentally observed regularities in the formation of a giant output pulse are explained using the following simplified model of the laser. It is assumed that the primary resonator is filled with the active medium and the lasing frequency shift occurs early, when the intensity of radiation is still low, as the two cavities tune to each other. From the practical standpoint, it is best to use lasers with lengths of primary and supplementary cavities which differ little. Figures 3, References 8: 7 Russian, 1 Western. [125-6508]

UDC 621.372.412

CONDITIONS OF GENERATION OF A COMPOUND CAVITY WITH LENSES

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 32, No 2, Feb 80 pp 255-261 manuscript received 17 Jan 79

GERASIMOVA, I. A., NESTERENKO, T. M. and KHAPALYUK, A. P.

[Abstract] A study is made of the conditions of stimulated emission of a laser with a compound cavity in which a positive lens is placed between each reflector and the active medium. Heterogeneity of the active medium is modeled by a combination of a plane convertor (such as a thin lens) which changes both the phase and the amplitude of the beam passing through it, and a homogeneous amplifying medium. The results of analysis of conditions of lasing in this cavity are compared with the results of study of a similar cavity without the lenses. Figures 4, References 5 Russian. [125-6508]

ACHIEVEMENTS OF PHYSICISTS

Moscow IZVESTIYA in Russian 21 Mar 80 p 6

[Article by R. Akhmetov, TASS correspondent, Moscow]

[Text] Two discoveries in the field of nuclear physics were registered with the USSR State Committee for Inventions and Discoveries on 20 March.

Joint research performed by Soviet and foreign scientists has been crowned with great success. Laws of similarity have been discovered for the interaction of high-energy particles.

"The concept of similarity (or scale) is well known to everyone from the experience of everyday life, mechanics and engineering," said the leader of the theoretical part of the work, USSR Academy of Sciences Vice-President A.A. Logunov, in commenting on the scientific importance of this discovery. "In different branches of science, laws of similarity have always advanced mankind significantly in his knowledge of the world around him."

The processes that take place in the microcosm are extremely complex.

The first experiments to study the basic characteristics of the multiple processes involved in the formation of elementary particles were conducted in 1969 near Moscow with the help of the Serpukhov accelerator, which is one of the largest in the world. Scientists from the Institute of Physics of High Energies and the European Center for Nuclear Research (Geneva) took part in them. The work was performed under the leadership of USSR Academy of Sciences Corresponding Member Yu. Prokoshkin and Professor A. Wetherell from England.

The conclusion at which the scientists arrived opens a new approach to evaluating different events in the microcosm.

The second discovery that was registered presented to science a fundamentally new mechanism for the interaction of atomic nuclei. It was accomplished by Soviet and Polish scientists working at the Joint Institute of Nuclear Research in Dubno. The discovery broadens the possibilities of experimental physics considerably.
[139-11746]

11746
CSO: 1862

UDC 518.9

GAME-THEORY APPROACH TO SOLUTION OF RECOGNITION OR CLASSIFICATION PROBLEMS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSSR, SERIYA A: FIZIKO-MATEMATICHESKIYE I TEKHNICHESKIYE NAUKI in Russian No 4, Apr 80 pp 82-83 manuscript received 9 Oct 79

STOGNIY, A. A., associate member, Academy of Sciences UkrSSR, and A. I. KONDRAT'YEV

[Abstract] An examination is made of a recognition problem in nonstandard form where information on accessible objects is contradictory. The formulation is given as an antagonistic two-person game in which the first player is nature, and the second is a person making a decision. The strategies of the first player are informational descriptions of objects, and those of the second player are recognition algorithms. A game position is produced by selection of a strategy by each player from his own set. Approaches to assignment of the optimality principle in the given game may be analytical, synthetic or mixed (analytic-synthetic). The game-theory model of the recognition problem is defined, and four theorems are stated. References 3 Russian.
[144-6610]

UDC 539.1.03

DIFFERENCE AND RELATION BETWEEN CHANNELED PARTICLES AND COHERENT BREMSSTRAHLUNG

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 251, No 2, 1980 pp 331-335 manuscript received 24 Jan 80

BELOSHITSKIY, V. V. and KUMAKHOV, M. A., Scientific Research Institute of Nuclear Physics, Moscow State University imeni M. V. Lomonosov

[Abstract] The authors consider emission of a particle moving in transient channeling conditions with beam incidence at a small angle to some crystallographic axis and plane, where both coherent bremsstrahlung and emission of channeled particles can occur. Particle motion is considered as motion in the potential averaged along the given crystallographic axis that makes a small angle with the direction of motion of the incident particle. It is shown that the maximum intensity of harmonic radiation decreases with an increase in the number of the harmonic in proportion to the frequency of the signal on the given harmonic. The intensity of channeled particle emission is dozens of times more intense than coherent bremsstrahlung on the most probable frequency, and the number of quanta on the frequency interval is hundreds of times greater. In the general

case, the two types of emission are interrelated, and the known charge dependence of emission can be explained by redistribution of the flux of channeled particles. Figure 1, references 13: 9 Russian, 4 Western. [145-6610]

UDC 539.23

SYNTHESIS OF TITANIUM NITRIDE IN A NITROGEN ATMOSPHERE AT HIGH PRESSURES UNDER LASER EXPOSURE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 251, No 2, 1980 pp 336-338 manuscript received 20 Nov 79

GALIYEV, A. L., KRAPIVIN, L. L., MIRKIN, L. I. and UGLOV, A. A., Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR, Moscow

[Abstract] An investigation is made of the structure of coatings applied by a new technique in which laser heat is used and the saturating element is in the gaseous phase. When laser emission acts on a metal in a transparent gas, at first only the backing is heated, and then a plasma is ignited next to the surface of the backing, which increases the activity of the saturating element. The backing is negatively charged to a certain potential difference by ambipolar diffusion of particles from the plasma in a region adjacent to the backing with thickness of the order of the Debye radius. This potential accelerates ions toward the surface of the specimen, increasing the interaction between the surface and the ambient medium. This process does not take place for external heat sources other than a laser. Experiments are described in which this technique is used to synthesize titanium nitride. Results are given on compound formation in the nitrogen-titanium system. Analysis of the experimental data shows that plasma shielding of the metal surface begins before onset of intense vaporization of the target, which prevents dispersal of the condensed material. The heating after this point is the combined result of laser and plasma radiation. As the nitrogen plasma interacts with the molten titanium, the resultant compound crystallizes under conditions of intense heat exchange with the cold backing. Layer thickness and grain orientation can be controlled by varying gas pressure, temperature, and the grain orientation of the backing. Figures 2, references 6 Russian. [145-6610]

GENERATION OF NEUTRONS IN EXPLOSIVE INITIATION OF THE DD-REACTION IN CONICAL TARGETS

Moscow PIS'MA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 31, No 1, 5 Jan 80 pp 67-70 manuscript received 22 Nov 79

ANISIMOV, S. I., BESPALOV, V. YE., VOVCHENKO, V. I., DREMIN, A. N., DUBOVSKIY, F. I., ZHARKOV, A. P., IVANOV, M. F., KRASYUK, I. K., PASHININ, P. P., PROKHOROV, A. M., TERNOVOY, V. YA., FORTOV, V. YE. and SHCHUR, L. N., USSR Academy of Sciences: Physics Institute imeni P. N. Lebedev, Institute of Theoretical Physics imeni L. D. Landau, Institute of Physical Chemistry

[Abstract] Promising plans of inertial nuclear fusion are based on implosion of reacting substances by a heavy liner accelerated because of ablation under the influence of intensive electronic, ionic and laser irradiation. Experiments were run to generate neutrons from the DD-reaction in conical targets. Compression and heating of the gas occurs with retardation of metallic liners accelerated by products of detonation of the condensed explosive agents. Neutrons were recorded by a plastic scintillation counter placed at a distance of 80 cm from the target behind a shield 4 cm thick. Neutron output was on the order of 10^6 neutrons per explosion. Neutron output increased with a reduction in the initial deuterium pressure. Figures 2; references 6: 5 Russian, 1 Western. [89-8617]

UDC 539.03

ON DYNAMIC INSTABILITY OF A CYLINDRICAL SHELL WITH AN ATTACHED MASS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSSR - SERIYA A, FIZIKO-
MATEMATICHESKIYE I TEKHNICHESKIYE NAUKI in Russian No 1, Jan 80
pp 43-46 manuscript received 5 Mar 79

KOVAL'CHUK, P. S., KOZLOV, S. V. and NOSACHENKO, A. M., Institute of Mechanics, UkSSR Academy of Sciences

[Abstract] A theoretical explanation is given of a number of experimentally established specific phonomena af the parametric loss of stability of circular cylindrical shells carrying concentrated masses. Of special interest are the phenomena of bifurcation of the domains of dynamic instability, double oscillatory hysteresis and traveling waves, due to the effect of the attached masses. Considered are the stability and nonlinear oscillation of a closed, circular cylindrical shell carrying a small mass M, rigidly fixed to its surface, under parametric excitation. Using the Bubnov-Galerkin procedure, a system of equations is obtained, implying that there are two domains of dynamic instability, B and C, where with a decrease of the mass M the domain B tends to the domain C and coincides with it at $M = 0$. Since the mass is small and the frequencies of the parametric load are close, a double parametric resonance can occur in the system. Analysis of equations of perturbed motion also shows that the axial dynamic asymmetry of the shell, due to the attached concentrated mass, causes a bifurcation of the domains of dynamic instability and the double oscillatory hysteresis of the main parametric zone. The traveling wave effect occurs in all cases, except when $M = 0$, or $\sin rx_0 = 0$ and $\cos 2sy_0 = 0$. The processes described also characterize other closed shells with axial dynamic asymmetry. Figures 3, references 6: 4 Russian, 2 Western.
[109-1015]

IMPACT COMPRESSION OF POROUS BODIES

Novosibirsk FIZIKA GORENIYA I VZRYVA in Russian Vol 15, No 6, Nov/Dec 79
pp 126-130 manuscript received 11 Jan 79

ANISICHKIN, V. P., Novosibirsk

[Abstract] The process of powder pressing by detonation yields new materials with useful properties not otherwise attainable. This applies to materials with a low initial density and, particularly, porous materials. Here theoretical and experimental studies are reviewed which have dealt with anomalous adiabatic compression behind the front of a shock wave and on the basis of which a model of this process has been constructed.

This model takes into account changes of the Grueneisen constant, dependent on the electronic component of the specific heat, and the absence of thermodynamic equilibrium behind the wave front. It relates the impact adiabatic to the initial-state isotherm of a material as well as the porous-state impact adiabatic to the continuous-state impact adiabatic of a material. Attempts have been made to calculate, accordingly, the volume of gas or vapor filling the pores behind the wave front and the contraction of pores as a function of the impact pressure. The impact adiabatics of a respectively vacuumized and air-filled porous material differ appreciably under low or medium impact pressure but only slightly under high-impact pressures. The author thanks V. M. TITOV for the helpful discussion. Figures 1; references 40: 25 Russian, 15 Western.
[129-2415]

RESISTIVE DOMAIN IN TYPE II SUPERCONDUCTORS

Moscow PIS'MA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 31, No 1, 5 Jan 80 pp 52-56 manuscript received 14 Nov 79

GUREVICH, A. VL. and MINTS, P. G., Institute of High Temperatures, USSR Academy of Sciences

[Abstract] The structure and motion of the interface between normal and superconductive phases in type II superconductors with transport current has been investigated many times. But the question of the existence and stability of normal regions of finite dimensions under the same conditions has remained virtually untouched. In the superconductive phase, there may exist standing resistive domains--solitons which have finite resistance. Resistive solitons similar to those examined may exist in thin superconductive films where the domain is governed by critical velocity. References 6: 4 Russian, 2 Western.
[89-8617]

CSO: 1862

-END-

END OF
FICHE
DATE FILMED

Oct. 1, 1980